WHAT IS CLAIMED IS:

1. A liquid-handling system for transferring liquid back and forth from at least one first container to at least one second container, comprising:

a means for sustaining a pressure differential between solutions in contact with two ends to drive transport,

at least one capillary tube having predetermined length and a predetermined internal diameter, wherein a first end of said predetermined tube is positioned near the bottom of said first container, and extends to a predetermined said second container; and,

means for increasing the relative pressure within said means for sustaining a pressure gradient in contact with two ends to drive transport;

whereby at least one of said liquid contained in said first container is transferred through said capillary tube to said second container when said pressure gradient or difference is applied.

2. The system as defined in claim 1, wherein said predetermined tube is sealed through a wall of said means for sustaining a pressure differential between solutions in contact with two ends to drive transport in a pressure-tight manner, containing said at least one first container.

3. The system as defined in claim 1, whereby at least one of said liquid contained in said first container is transferred through said capillary tube by means of at least one of an intrinsic and an extrinsic vacuum source.

4. The system as defined in claim 1, further comprising:

a first capillary tube spacing means to position a first end of said at least one capillary tube near the bottom of said first container; and,

a second capillary tube spacing means to position a second end of said at least one capillary tube in a manner to deliver said liquid to said second container.

5. The system as defined in claim 4, wherein said first capillary tube spacing means is a first manifold and said second capillary tube spacing means is a second manifold.

6. The system as defined in claim 5, further comprising a plurality of said first containers deployed in a first array, and a plurality of said second containers deployed in a second array.

7. The system as defined in claim 6, further comprising:

a first translation subsystem means for transferring said first array in and out of said means for sustaining a pressure gradient between solutions in contact with two ends to drive transport, containing said at least one first container;

a second translation subsystem means for raising and lowering said first array;

a third translation subsystem means for moving, transferring, raising and lowering said second array; and

at least a supplemental means for moving, transferring, raising and lowering a microplate.

8. The system as defined in claim 7, further comprising computer means to control said first, second, and third translation means.

9. The system as defined in claim 1, wherein said at least one capillary tube is constructed of a material selected from the group consisting of pulled glass, pulled glass with an external coating, polyamide, polyethylene, polypropylene, polytetrafluoroethylene, polyester, PEEK(polyethylenetherketone), stainless steel and other chemically unreactive materials.

10. The system as in defined claim 9, wherein said means for raising said pressure within said means for sustaining a pressure gradient between solutions in contact with two ends to drive transport comprises a source of pressurized gas selected from the group consisting of air, nitrogen, argon, helium, combinations of the same and the like.

Sub B5

11. The system as defined in claim 10, wherein said pressure is at least one of raised to between about 0.5 lb. per square inch and about 10 lb. per square inch and drawn by a vacuum source having a predetermined force value.

12. The system as defined in claim 10, wherein said pressure is used with viscous fluids and is within a range of up to about 1000 psi.

13. The system as defined in claim 1, wherein said at least one capillary tube has a predetermined length selected from a range of about 10-100 cm. and has a predetermined inner diameter selected from a range of about 10-500 μ.m.

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14. The system as defined in claim 1, whereby solutions are deposited and removed in either direction by at least one of sequential and parallel transport of said solutions from a well having at least two capillaries, including the deposit of two or more solutions to be mixed and removal of a resulting mixture by an additional capillary.

15. A method for transferring a predetermined amount of liquid to and from a first container holding a first volume of liquid to a second container and back comprising the steps of:

providing a means for sustaining a pressure gradient between solutions in contact with two ends to drive transport;

at least one capillary tube having predetermined length and a predetermined internal diameter, wherein a first end of said predetermined tube is positioned near

the bottom of said first container, and extends to a predetermined said second container; and

means for increasing the pressure differential between the two ends, whereby said liquid contained in said first container is transferred through said capillary tube to said second container when at least one of said pressure gradient or difference is applied;

(a) calibrating said capillary tube;

(b) calculating the transfer time required to transfer said predetermined amount of liquid; and

(c) increasing the pressure within said box to said predetermined pressure for said transfer time to transfer said predetermined amount of liquid from said first container to said second container when said pressure gradient or difference is applied.

16. A method according to claim 15, wherein said means for sustaining a pressure gradient between solutions in contact with two ends to drive transport is preferably a pressure box for containing said at least one first container, and said calibrating step further comprises the steps of:

- filling said first container with said liquid;
- filling said capillary tube with said liquid;
- increasing said pressure within said box to a predetermined pressure for a predetermined period of time to transfer a quantity of said liquid to said second container;
- measuring said quantity of said liquid thus transferred with a means for measuring; and,
- calculating the measured amount of liquid transferred per unit time

17. A method according to claim 16, wherein said predetermined tube is sealed through a wall of said box in a pressure-tight manner.

18. A method according to claim 16, whereby a pressure differential is effected by means of at least one of an intrinsic and an extrinsic vacuum source.

19. A method for using the system of claim 14 for transferring a defined amount of liquid from said first container holding a first volume of liquid to said second container comprising the steps of:

(a) calibrating said capillary tube;

(b) using said system to deliver defined amounts by:

- filling said first container with liquid;
- cooling with means for cooling said second end of said capillary tube to below the freezing point of said liquid;
- increasing the pressure within said means for sustaining a pressure differential between solutions in contact with two ends to drive transport, whereby liquid fills said capillary tube and forms a frozen plug upon reaching said second end;
- thawing said frozen plug with heating means; and
- increasing the pressure within said means for sustaining a pressure differential across said tube whereby liquid is expelled from said capillary tube and delivered to said second container.

20. The method of claim 19, said calibrating step further comprises:

- filling said first container with liquid;
- cooling with means for cooling said second end of said capillary tube to below the freezing point of said liquid;
- increasing the pressure differential across said tube, whereby liquid fills said capillary tube and forms a frozen plug upon reaching said second end;

- thawing said frozen plug with heating means;
- increasing the pressure within said whereby liquid is expelled from said capillary tube; and,
- determining said defined amount by measuring with a measuring means the liquid thus expelled;

21. The method as in claim 14 wherein said cooling means is a member selected from the group consisting of Peltier cooling systems, cryogenic fluid flow systems, liquid nitrogen, liquid air, liquid helium, chilled gases, ice, and solid carbon dioxide; and wherein said heating means are a member selected from the group consisting of Peltier heating systems, resistive heating systems, air flow systems, and hot water.

22. A method for stopping and starting the flow of a liquid in the capillary tube of the system of claim 1, said method comprising:

(a) floating, on the surface of said liquid in said first container, a chemically inert liquid substance having a freezing point above the freezing point of said liquid in said first container and a density below the density of said liquid in said first container;

(b) cooling with means for cooling at least one of said first and second end of said capillary tube to below the freezing point of said chemically inert substance;

(c) increasing the pressure differential across the tube whereby liquid fills said capillary tube, and flows through until said inert substance forms a frozen plug upon reaching said second end.

23. The method ~~as defined~~ in claim 15, whereby a fixed closed volume is defined through the definition or two spatially separate frozen zones, which fixed closed volume may be subject to other reactions.

24. The method as defined in claim 14, wherein said means for measuring are at least one means selected from a means for measuring volume and a means for measuring weight.

25. The method as defined in claim 15, wherein said means for measuring are at least one means selected from a means for measuring volume and a means for measuring weight.

26. The method as in claim 15 wherein said cooling means is a member selected from the group consisting of Peltier cooling systems, cryogenic fluid flow systems, liquid nitrogen, liquid air, liquid helium, ice, and solid carbon dioxide; and wherein said heating means are a member selected from the group consisting of Peltier heating systems, resistive heating systems, gas flow systems, and hot water.

27. The method as in claim 14 wherein said substance is a member selected from the group consisting of waxes, polymers and fluorocarbons.

28. A method for using the system as defined in claim 14, wherein said system further comprises a waste container, whereby ~~said~~ liquid that has been transferred to said second container is transferred to said waste container, comprising the steps of:

(a) positioning said second end of said capillary to the bottom of said second container;

(b) decreasing said atmospheric pressure within said box to transfer said liquid from said second container to said capillary;

(c) positioning said second end of ~~said~~ capillary over said waste container;

(d) increasing said atmospheric pressure within said box to transfer said liquid in said capillary to said waste container.

29. A method as defined in claim 26, wherein a volumetric flow rate (Q) is excerised in at least one of a forward and reverse direction as described by Equation 1:

$$Q = \frac{\pi \Delta p r^4}{8 \mu L} \qquad \text{Eq. 1}$$

Where **Δp** is the differential pressure between the two ends of the capillaries, **r** is the radius of the capillary, **μ** is the viscosity of the fluid and **L** is the length of the capillary; and the displaced volume (V) is linear with respect to time (t) and is shown by Equation 2:

$$V = \frac{\pi \Delta p r^4 t}{8 \mu L} \qquad \text{Eq. 2}$$

30. The method as defined in claim 19, said cooling step further comprising a controlling freezing location located between the first and second ends of said capillary.